

XXI.—ON TWO NEW SPECIES OF EAGLE-
RAYS (*MYLIOBATIDÆ*), WITH NOTES
ON THE SKULL OF THE GENUS
CERATOPTERA.

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During a brief collecting trip to Puri, on the Orissa Coast, recently taken in conjunction with Dr. N. Annandale, we were informed that a gigantic fish had been lately caught in the seine net of some local fishermen, who regarded the capture as a most unusual event. Search was made for evidence of this story, with the result that a portion of an immense ray was found almost buried in sand close to high-water-mark.

The specimen, although in an advanced stage of decomposition, was covered with tough skin, so that the form of the head was completely preserved. From the appearance of the wide mouth, gaping directly forwards and flanked by two cephalic flippers, the fish was recognised to be one of those rays which, owing to their gigantic size, are rarely captured, and still less often appear in Museum collections. The specimen, which measured three feet nine inches across the head from eye to eye, was despatched to the Indian Museum.

Unfortunately the great pectoral fins had been cut off at the time of its capture, but the complete head and shoulder girdle with the intervening gill bars were obtained. A detached tail-like portion of vertebral column was found close by, bearing a median dorsal fin and a curious rounded knob (plate v, fig. 3). From the character of the skin this was seen to be part of the same remarkable fish. The dorsal fin in the *Myliobatidæ* is situated at the hinder end of the disc between the pelvic fins; this detached portion must therefore belong to the disc and not to the tail; furthermore, the anterior end of it fits on to the exposed centrum which terminates the vertebral column behind the shoulder girdle.

The *Myliobatidæ* are by some authors divided into two groups, —*Myliobatina* and *Ceratopterina*. It will be shown further on that this division is highly justifiable. It is difficult to imagine two structures more unlike one another than the skulls of *Ceratoptera* and *Aëtobatis*, the latter genus being taken as an example of the *Myliobatina*.

The group *Ceratopterina* contains three genera, two of which have been long known. All three are characterised by possessing

long cephalic flippers or horns one on either side of the head. They may be briefly defined thus—

- (1) *Dicerobatis* (Blainville) has an inferior mouth, teeth in both jaws, and a smooth skin.
- (2) *Ceratobatis* (Boulenger) like *Dicerobatis*, but teeth restricted to the upper jaw.
- (3) *Ceratoptera* (Müller and Henle) has an anterior mouth, teeth in the lower jaw only, and numerous denticles on the skin.

Our specimen from Puri evidently belongs to the last of these (*Ceratoptera*), although the genus has not been hitherto recorded from the Bay of Bengal,¹ and is known from only a very few specimens.

Two species have been recognised: *Ceratoptera vampyrus* (Duméril), found in American seas, bears 100 series of teeth on the lower jaw (this is the *Manta birostris* of American writers, the much-dreaded devil fish of the Panama pearl fisheries); the other, *C. chrenbergii*, bears 200 series of teeth, seven in each series, and is found in the Red Sea.

In a footnote to page 498 of his *Catalogue of Fishes*, vol. viii, Günther writes: "On an unpublished² plate of the *Symbolæ Physicæ* this species" (*C. chrenbergii*) "is named *Cephaloptera stelligera*; the horns are horizontally bent inwards." Reference to this plate shows that our specimen from Puri bears a considerable resemblance to the species from the Red Sea; even the denticles of the skin, which are clearly depicted, show a marked similarity in the two cases. In the *Symbolæ Physicæ* each denticle is shown as a stellate (usually six-rayed) base bearing a bluntly pointed tubercle which in some cases shows slight irregularity. It is possible that the horns may have been bent inwards during life but our photographs (plate iv) show what seemed to be the natural position of these appendages.

Ceratoptera orissa, sp. nov.

The specimen from Puri, for which the name *Ceratoptera orissa* is proposed, is differentiated from the others by the following features:—

- (1) The dentition of the lower jaw is in 370 series, each consisting of 14 teeth. In their peculiar columnar form and in the regularity of their arrangement, the teeth show a close similarity to those depicted in the *Symbolæ Physicæ*. Each tooth is separated by a well-marked interspace from its neighbours (text-fig. 1).

¹ Day, relying on a woodcut published by Sir Walter Elliot, has provisionally included *Ceratoptera* among the fishes of India. A comparison of this woodcut with the figure in the *Symbolæ Physicæ* and with our specimen from Puri shows, however, that this woodcut cannot be regarded as a representation of *Ceratoptera*.

² Published subsequently in *Symbolæ Physicæ*, Berlin, 1899.

- (2) Behind the dorsal fin is a remarkable globular swelling of the size of a man's fist (fig. 3, plate v). This is not present in the other species.
- (3) The denticles of the skin consist of a stellate base, usually six-rayed, which bears a multifid spine.

Other specific characters cannot be defined as the specimen was incomplete.

The diagram, plate x, fig 2, which is drawn to scale, shows the principal measurements of the head.

The upper surface of the head and adjacent portions of the disc were of a dark greenish grey colour contrasting sharply with the pure white of the oral surface.

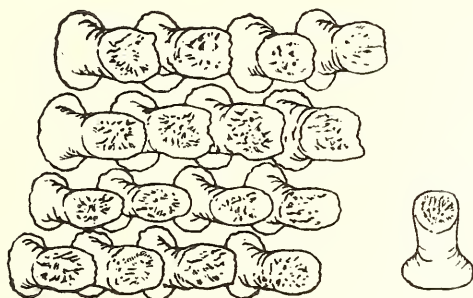


FIG. 1.—Teeth of *Ceratoptera orissa*, sp. nov.

The upper surface of the cephalic flippers and the sides of the head were white, as were the lower two-thirds of the ocular prominences.

The mouth was overhung by a thin curtain or velum of white skin; the depth of this curtain was about four inches except towards the middle where it was considerably reduced, allowing a view of the interior of the mouth.

This velum, which is analogous to an upper lip, is quite distinct from the broad nasal flap; it resembles that structure and is attached behind it. Figure 2, plate v, shows these features, as well as the band of teeth on the lower jaw. Other measurements are as follows:—

Between the nostrils	..	..	61 cms.
Width of mouth	..	..	55 „
Dimension of the band of teeth	..	..	47 by 2·5 cms.
Greatest diameter of eyeball	..	..	7 „
Corneal aperture of eye	..	..	2 „
Greatest diameter of spiracle	..	..	5 „

The cranium of *Ceratoptera orissa* consists of a single lamina of cartilage measuring 95 cms. in breadth but only 20 in length in the middle line. The outer ends of this lamina turn forwards as two spatulate projections which lie over and support the bases of the

cephalic fins. The skeleton of these fins, as in the other members of the *Myliobatidae*, is directly continuous with the skeleton of the pectoral fins. The actual brain case is a very insignificant part of the cranium, being represented by a dome-shaped box measuring only 13 cms. in breadth, situated close to the condyles.

With the exception of the small portion which lodges the brain, this cranial lamina has a uniform thickness of half an inch in the dried state. It terminates laterally in simple margins, hence the cranium appears to be devoid of true orbits. At one point, on either side, the dry cartilage composing these margins is prolonged outwards towards the eyes as two slender shrivelled tubes which doubtless contained the optic nerves. Owing to decay it was impossible to ascertain the point at which the ocular muscles were attached to the cranium; this point would have indicated the site of the orbit.

The eyes were well preserved for, as in many other large elasmobranch fishes, the sclerotic coat was composed of thick tough cartilage; in this case the cartilage composing the back of the eyeball was more than half an inch in thickness; it was indeed so massively developed that on first examination it was thought to be the orbit itself which had been attached to the cranial margin by the slender tubular prolongation beforementioned. This misunderstanding was corrected by finding traces of the tendinous insertions of the ocular muscles attached to the outer surface of the globe.

The jaws and their suspensory apparatus were of the type common to the order. The hyomandibular is laminate in form and is firmly attached at its upper (or inner) end to the cranium close to the occipital condyle of the same side; it also receives additional support by being, as it were; wrapped round the posterior margin of the cranial plate. Its lower (or outer) end supports the jaws and hyoid. The upper and lower jaw differ remarkably in appearance.

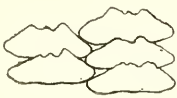
The upper jaw is a straight slender bar, no thicker than a man's thumb, attached at either end to the hyomandibulars. The lower jaw, which has, of course, the same attachments, is a massive plank-like structure measuring 12 cms. in depth; one surface of this looks upwards and forwards and bears the curious ribbon-like band of teeth which are detachable with the skin.

The lower edge of the mandible forms a prominent ridge sharply defining the oral face from the ventral surface; in the same way the anterior margin of the cranial lamina, which forms an open curve, sharply separates the oral face from the dorsal surface.

The skeleton, which carries the great pectoral fins on either side, is prolonged forwards beneath the spatulate processes of the cranium, to render support to the cephalic fins; beneath these processes it is united to the cranium itself by a cartilaginous bar which is fixed to the cranium just outside the nasal fossa (point \times , fig. 1, pl. x).

In order that a better understanding of the cranium might be arrived at, the skull of *Aëtobatis*, a common genus belonging to the *Myliobatina*, was cleaned and examined.

This was so different from the skull of *Ceratoptera* that it has been shown in outline in fig 3, pl. x. The cranium of *Aëtobatis* is a box-like structure provided with well-developed orbits, that is to say it is not unlike the type found in many other elasmobranch fishes, but a great contrast to that of *Ceratoptera*. This difference is so marked that a separate origin for the two divisions of the *Myliobatidæ* might have to be admitted. In order to demonstrate this, an examination of the skulls of other genera of the family would be necessary.

FIG. 2.—Teeth of *D. eregoodoo*.FIG. 3.—Teeth of *D. thurstoni*.

During a recent visit to Madras I had, through the kindness of Mr. E. Thurston, an opportunity of examining the large rays in the Museum of that city. Among them are two examples of *Dicerobatis* which clearly belong to separate species. Photographs of these are shown on plate iv. One of them agrees closely with the definition of *D. eregoodoo*, the species usually found in Indian seas, though by no means commonly. Cantor¹ gives a full description of this fish; regarding the teeth he writes: "the teeth are uniformly minute, flattened, of a pentagonal shape, with backwards directed points; they have frequently two or three such points; they are generally twice broader than long. The upper jaw has 80, the lower jaw 94 rows of teeth." The teeth of the specimen in the Madras Museum has 60 rows of teeth in the upper jaw, but in form (text-fig. 2) they agree with Cantor's description; the teeth of the same species are shown by Duméril² in a figure which shows some slight difference. In spite of this the smaller Madras specimen should, I think, be placed in the species *D. eregoodoo*. The larger specimen is quite different, however; it has twice as many teeth, which are of a different character. As it does not appear to resemble any known species it has been described here.

Dicerobatis thurstoni, sp. nov.

Teeth in 140 series in the upper jaw, extending nearly to the angle of the mouth. Each tooth is separated from its neighbours by an interval, and consists of an irregular nodular base bearing from two to four spinous cusps (text-fig. 3).

¹ *Catalogue of Malayan Fishes*, p. 1420.

² *Hist. Nat. des Poissons*, pl. 6, figs. 2—5.

The teeth of the lower jaw could not be counted in the dry specimen as the lip was curled over; they seemed to be about as numerous as those of the upper jaw. Tail smooth, less in length than the disc, and without a spine. Proportions generally like *D. eregoodoo*, but the cephalic fins are relatively shorter than in that species; furthermore, the termination of the disc between the cephalic fins is wider, and forms a more open curve (more nearly a straight line) than in *D. eregoodoo*.

The measurements of the dry specimen are as follows:—

Greatest breadth	160 cms.
Length of disc in the middle line (excluding pelvic fins) ..	73 „
Distance between the eyes ..	27 „
Eye to tip of cephalic fin ..	13 „
Nostril to nostril	16 „
Spiracle to posterior border of the eye	4.5 „
Length of tail	53 „

EXPLANATION OF PLATE IV.

FIG. 1.—*Dicerobatis eregoodoo*, ventral surface, $\frac{1}{6}$ nat. size.

„ 2.—*D. thurstoni*, dorsal surface, $\frac{1}{11}$ nat. size.

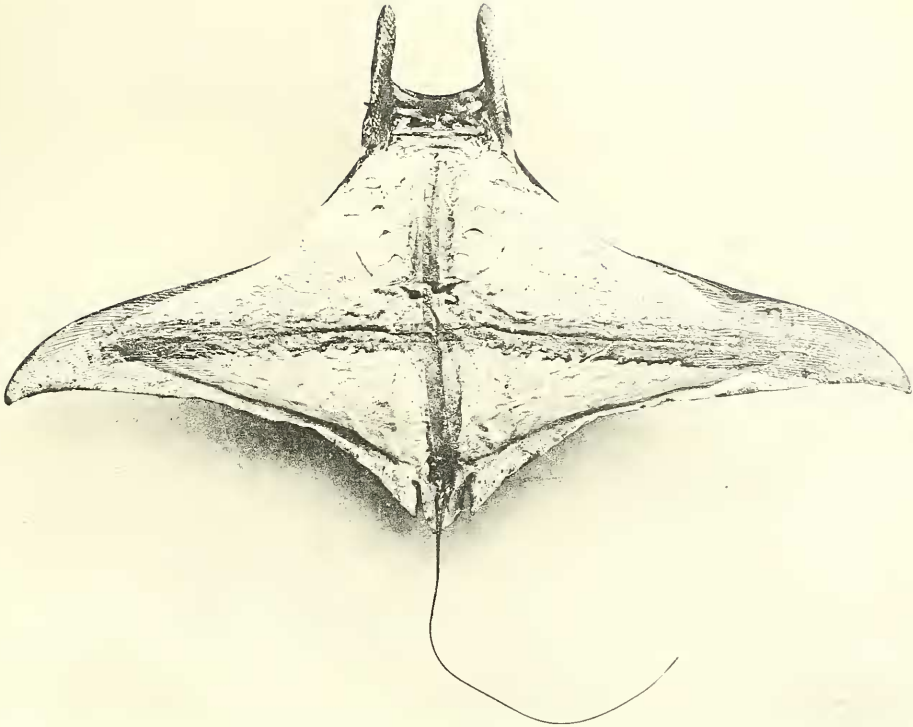


Fig. 1.

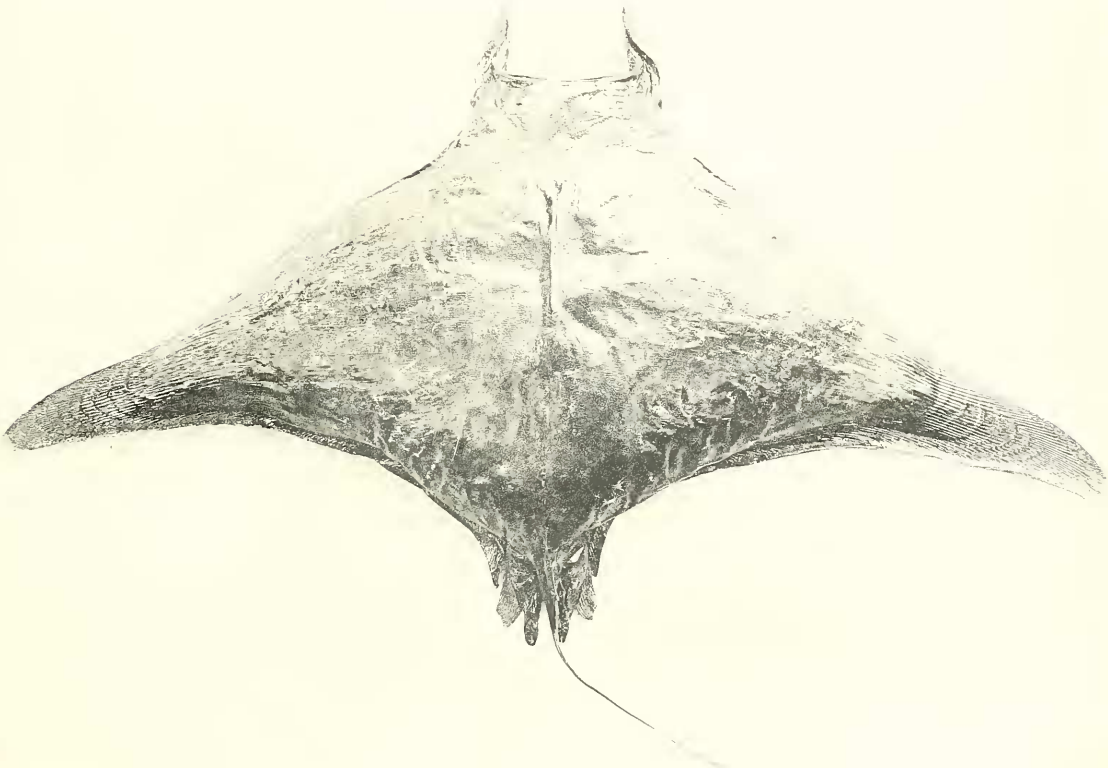


Fig. 2

EXPLANATION OF PLATE V.

FIGS. 1 AND 2.—Side and front view of the head of *Ceratoptera orissa*, $\frac{1}{15}$ nat. size. In fig. 2 the band of teeth can be seen close to the lower margin of the mandible; black paper has been placed in the left nostril.

FIG. 3.—Vertebral column and dorsal fin of the same fish.

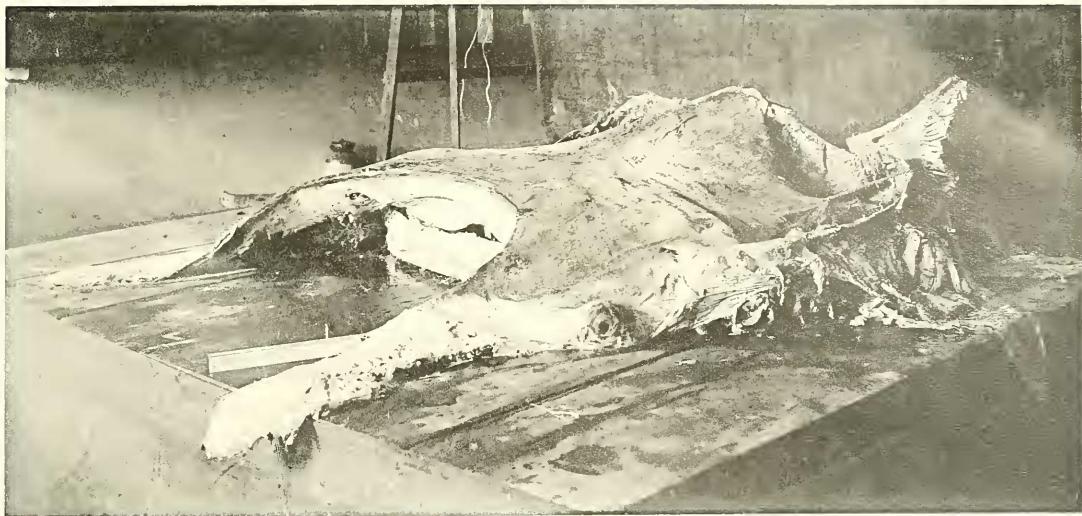


Fig. 1.

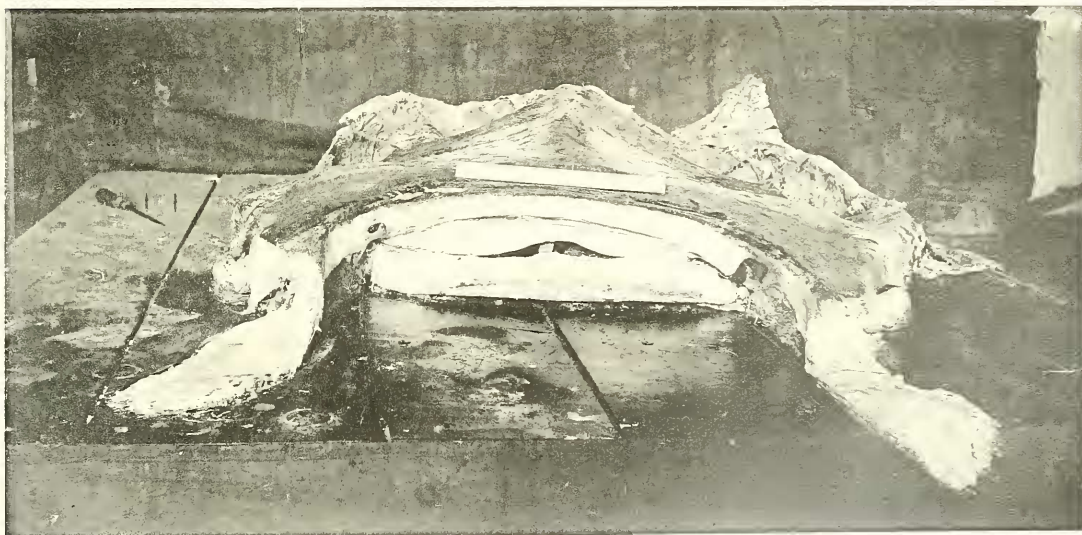


Fig. 2

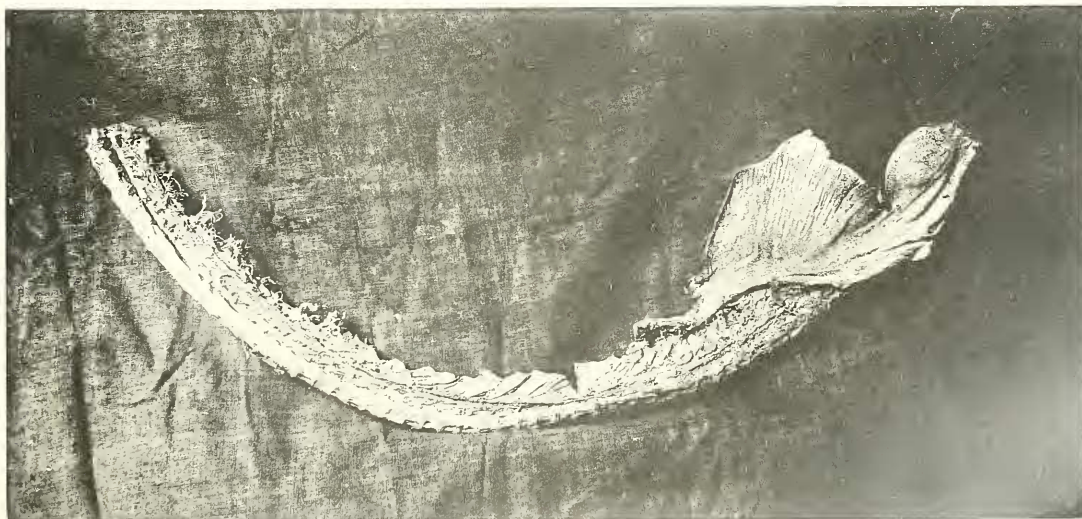


Fig. 3.

EXPLANATION OF PLATE X.

- FIG. 1.—Diagram, to scale, of the skull of *C. orissa*: *b.c.* = brain case; *l.j.* = lower jaw; *u.j.* = upper jaw; *c.f.* = cephalic fin; *o.c.* = occipital condyle; *hm.* = hyomandibular; *n.c.* = nasal capsule; *e.* = sclerotic cartilage; *o.p.* = prolongation of the cartilage towards the eye (sheath for optic nerve); *sc.* = scapula; *co.* = coracoid; *j.* = junction of hyomandibular with the cranium: the branchial arches have been omitted; the cranium proper is shown in thick outline: *a* and *b* = denticles of the skin from above and from the side.
- „ 2.—Diagram, to scale, of the head of *C. orissa*; figures represent centimetres.
- „ 3.—Cranium of *Aëtobatis narinaria* showing well-defined orbits: *o.* = orbit; *e.* = eye; *c.f.* = cephalic fin.

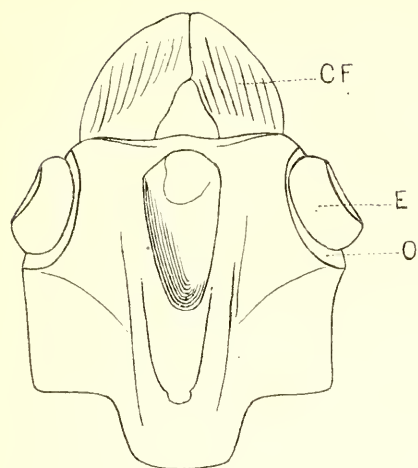


Fig. 3.

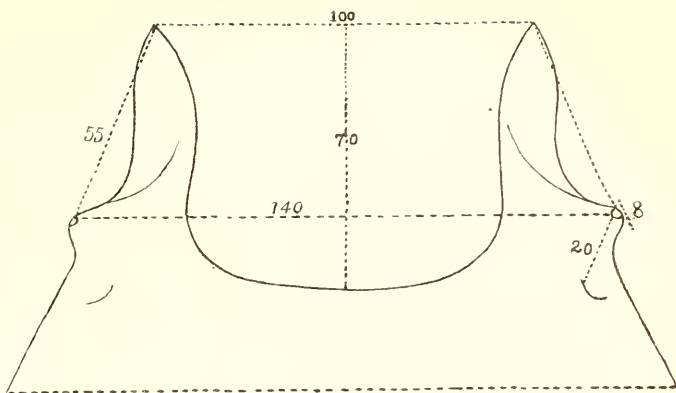


Fig. 2.

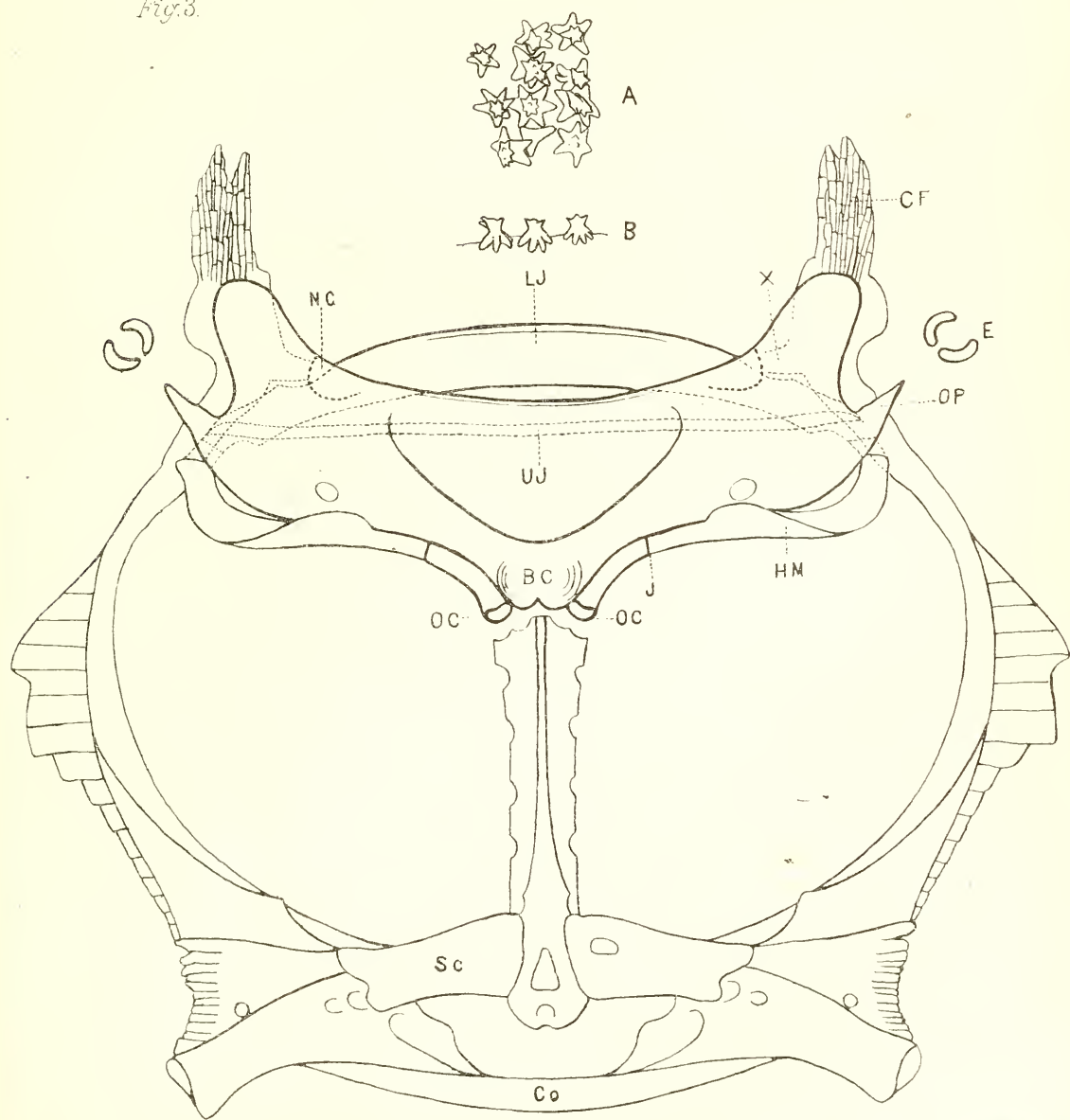


Fig. 1.